

Abundance and Run Timing of Dolly Varden in the Kanektok, Togiak National Wildlife Refuge, 2007

Alaska Fisheries Data Series Report Number 2008-14



**Togiak National Wildlife Refuge Office
Dillingham, Alaska
May 2008**



The Alaska Region Fisheries Program of the U.S. Fish and Wildlife Service conducts fisheries monitoring and population assessment studies throughout many areas of Alaska. Dedicated professional staff located in Anchorage, Juneau, Fairbanks, and Kenai Fish and Wildlife Offices and the Anchorage Conservation Genetics Laboratory serve as the core of the Program's fisheries management study efforts. Administrative and technical support is provided by staff in the Anchorage Regional Office. Our program works closely with the Alaska Department of Fish and Game and other partners to conserve and restore Alaska's fish populations and aquatic habitats. Additional information about the Fisheries Program and work conducted by our field offices can be obtained at:

<http://alaska.fws.gov/fisheries/index.htm>

The Alaska Region Fisheries Program reports its study findings through two regional publication series. The **Alaska Fisheries Data Series** was established to provide timely dissemination of data to local managers and for inclusion in agency databases. The **Alaska Fisheries Technical Reports** publishes scientific findings from single and multi-year studies that have undergone more extensive peer review and statistical testing. Additionally, some study results are published in a variety of professional fisheries journals.

Disclaimer: The use of trade names of commercial products in this report does not constitute endorsement or recommendation for use by the federal government.

Abundance and Run Timing of Dolly Varden in the Kanektok River, Togiak National Wildlife Refuge, 2007

Mark J. Lisac

Abstract

Dolly Varden annual run timing, total run and spawner abundance were estimated in the Kanektok River using a salmon escapement monitoring weir from 19 June to 11 September, 2007. The 2007 run timing was similar to the four prior years of run monitoring. The total run abundance of 12,784 was the second highest recorded during the five years that the run has been monitored. The number of mature, prespawning Dolly Varden was estimated by apportioning the weir counts based on a sample of 175 fish caught in the weir live trap. In 2007, approximately 11,481 mature Dolly Varden passed upstream of the weir. Previous estimates for the years 2002 through 2005 averaged approximately 7,682 (range 5,815 – 9,073) mature Dolly Varden.

Introduction

Dolly Varden are an important component of the subsistence harvest, the sport fishery and the ecosystem in the Kanektok River drainage in southwest Alaska. Although no quantitative harvest estimate is available for the Kanektok River Dolly Varden subsistence fishery, Dolly Varden are likely harvested in such quantities to match or exceed the harvest of salmon by weight (Wolfe et al. 1984). Between 2001 and 2005, the sport catch has averaged 19,130 char (Dolly Varden and Arctic char combined) in the entire Kanektok River (Chythlook 2006). This is the highest estimated catch among all sport fisheries in the Kuskokwim region.

To aid in developing a long term monitoring program for Dolly Varden populations in southwest Alaska, the Togiak National Wildlife Refuge (Refuge) initiated research to learn more about their life history and habitat use throughout the Refuge (Lisac and Moran 1999; Lisac and Nelle 2000; Reynolds 2000; Lisac and Buchholtz 2001; Crane et al. 2003; Lisac 2002, 2004, 2006, 2007a, 2008; Lisac and Bromaghin 2007) and specifically in the Kanektok River (Lisac 2004, 2006; 2007b). Radio telemetry and visual marking have been used to document biological characteristics, life history aspects, and to identify spawning and overwintering areas of anadromous Dolly Varden in the Kanektok River drainage (Lisac 2006). Dolly Varden annual run timing, total run and spawner abundance have been estimated in the Kanektok River using a salmon escapement monitoring weir since 2002 (Lisac 2006, 2007b). For most years the majority of the run occurs between 16 July and 7 August. For all years from 2002 to 2005, the run has averaged 11,206 fish and ranged between 9,195 and 15,674 fish (Appendix 1).

Using the annual returns of Dolly Varden as the basis for monitoring population health and abundance is difficult because the annual returns are usually composed of stocks of mixed origin and mixed maturity (DeCicco 1985; Whalen 1992; Larson 1997; Lisac and Nelle 2000; Lisac 2004, 2006, 2007a, 2007b). Estimating the number of Dolly Varden spawners returning annually to the drainage is more useful for understanding long-term population trends. Beginning in 2002, the annual passage of mature, prespawning Dolly Varden into the Kanektok River was estimated by apportioning the weir counts based on the maturity of fish sampled from

the weir live trap (Lisac 2006,2007b) or seining (Lisac 2004). From 2002 to 2005, we captured approximately 2.6% to 13.8% of the annual Dolly Varden run counted at the weir during July to mid-August. Although the weir picket spacing may allow smaller fish (< 420 mm) to pass through the weir undetected (Lisac 2006) the proportion of mature fish (prespawners) in the annual samples was between 55.0% and 98.5%. During these four years an average estimated 7,682 (range 5,815 – 9,073) prespawning Dolly Varden passed upstream of the weir.

The purpose of this report is to provide a summary of the data collected during the 2007 season and compare it to past results. The objectives addressed in this report are to: 1) determine the annual run timing of Dolly Varden passing upstream of the Kanektok River weir; 2) estimate the number of prespawning Dolly Varden passing the Kanektok River weir during July to mid-August; and, 3) collect length, sex and maturity data from Dolly Varden immigrating past the Kanektok River weir.

Study Area

The Kanektok River drainage lies along the northern boundary of the 4.7 million acre Togiak National Wildlife Refuge in southwest Alaska (Figure 1). The river originates in the Ahklun Mountains in the northeast corner of the Refuge and drains approximately 2,261 km² (Walsh et al. 2005). The Kanektok River flows from Kagati and Pegati lakes, elevation 320 m, and flows west for 146 km to Kuskokwim Bay. Numerous unnamed tributaries feed the lakes. Two named tributaries, Atmugiak and Akamunak creeks, feed Kagati Lake. The upper portion of the river is a single channel as it flows through mountain valleys. The river emerges from the mountains and flows across a broad alluvial plain composed primarily of gravel substrate where the river becomes braided with multiple side channels. The upper 116 km of the Kanektok River are within the Refuge Wilderness Area while the lower 30 km of river are bordered by Quinhagak Village corporation lands. The Village of Quinhagak is located near the mouth of the Kanektok River at Kuskokwim Bay.

The project weir is located approximately 70 river km upstream of Kuskokwim Bay. Four major tributaries flow from the south and join the Kanektok River upstream of the weir site and below Kagati Lake. They are (from lower to uppermost): Takshilik, Nukluk, Klak, and Kanuktik creeks. Several smaller named tributaries flow from the north: Quickumguila, Olumagwilute, Sam, Nakailingak, Amakatatee and Paiyun creeks. Only Kanuktik and Klak creeks have headwater lakes of any significant size.

Methods

Dolly Varden migrating upstream in the Kanektok River are counted at the weir and recorded as daily totals. The total run is the number of all Dolly Varden counted during the entire season of weir operation. The weir has operated since 2001 for all years except 2006. Estensen (2001) and Jones and Linderman (2006) provide detailed descriptions of how this weir is configured and operated. Lisac (2004, 2007b) provides details of how the weir was used to capture Dolly Varden.

All fish that could be captured were sampled with a minimum sample size goal of 10% of the total Dolly Varden counted during each time stratum. Capture and sampling efforts concentrated on the early portion of the run between early July and mid-August when the proportion of prespawning Dolly Varden is higher (Larson 1997; Lisac and Nelle 2000; Lisac 2004, 2006, 2007a, 2007b).

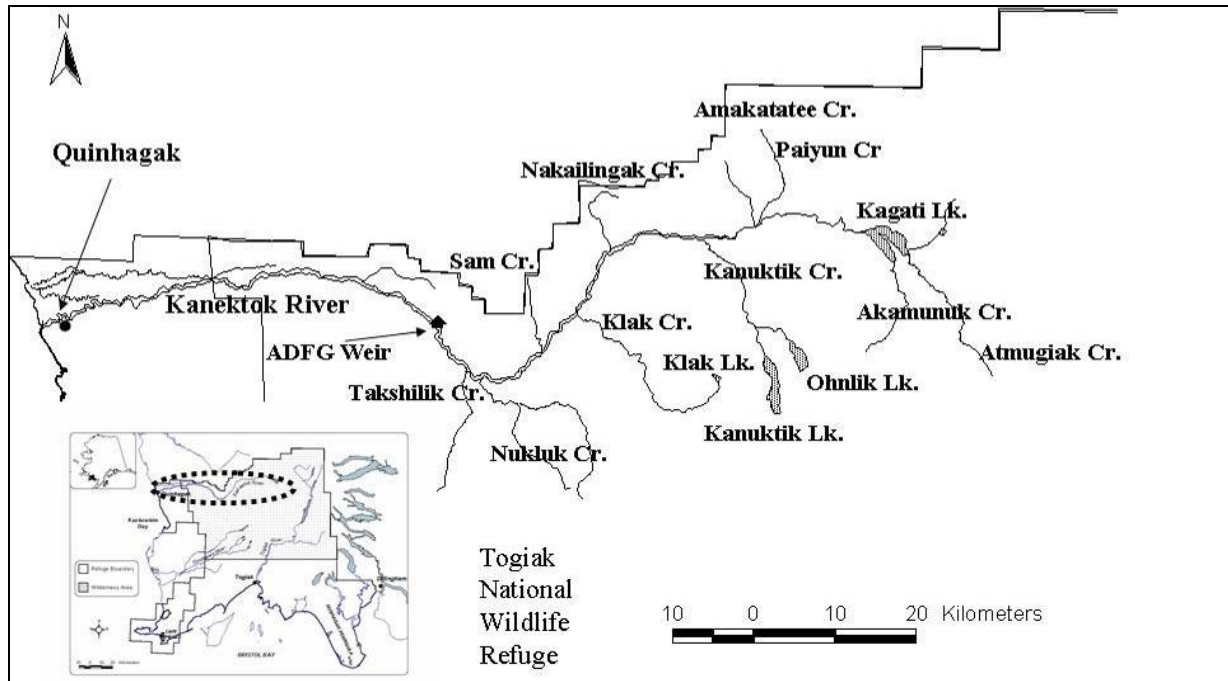


FIGURE 1. —Kanektok River Drainage.

Lengths were measured from tip of snout to fork of the caudal fin and recorded to the nearest 1.0 mm. Length frequency distributions are presented in 10 mm increments. Dolly Varden greater than 250 mm were marked with an individually numbered T-bar anchor tag. Sex, color code and maturity were recorded for each fish.

Maturity of fish was determined using external characteristics as previously reported by Lisac (2006) and adapted from DeCicco (1985). Fish were classified as immature, nonspawner, prespawner, or unknown. Prespawners are fish that are likely to spawn during the current year whereas nonspawners are sexually mature fish that are not likely to spawn in the current year. Photographic keys were used to train field personnel to identify sex and maturity of fish based on external characteristics. The primary external characteristics used were the coloration of the body, head, jaw and fins. Fish characterized as color code 1 (silver or showing no color) were usually classed as immature, nonspawner or unknown. Mature prespawners were either color code 2, showing signs of color change (darkening opercle, head and jaws, reddening of fins with white leading edge); or color code 3 - full spawning colors. Head shape, kype formation, a swollen ovipositor or swollen abdomen were used as sex determinant characteristics.

The number of mature prespawners was estimated for that portion of the Dolly Varden run counted through the weir between the date when the weir first became operational (19 June) and the end of the sample period (15 August), and is referred to as the “apportioned run”. Because the sample size was small and the effort was concentrated primarily in the early part of the run, the sample period was divided into 2 time strata split just prior to the peak of the run; 19 June to 22 July, and 23 July to 15 August. The proportion of prespawners in each time stratum and their respective variances, were estimated as simple proportions (Cochran 1977) of the combined daily samples in each time stratum. The number of prespawning fish was estimated by

multiplying the total Dolly Varden weir count for each time stratum by the proportion of prespawners in the sample for that time stratum (Larson 1997; Lisac 2006).

Results

The Kanektok River weir operated for a total of 85 days from 19 June to 11 September 2007 (Appendix 1; Appendix 5). A total of 12,784 Dolly Varden were counted through the weir. The first Dolly Varden was counted on 19 June and the midpoint of the run occurred on 25 July (Figures 2; Appendix 1). Approximately 50% of the run arrived during the 12-day period between 18 and 29 July and the date of peak passage was 27 July ($N = 1,343$) (Figure 3). Approximately 70% of the run had passed the weir by 28 July, nine days earlier than the average for past years.

A total of 175 Dolly Varden were captured during 14 days of sampling between 19 June and 11 September (Table 1; Figure 3). Of these 173 fish were measured for fork length (Figure 4; Appendix 3, 4). Fork length ranged 241 mm to 631 mm and averaged 474.2 (SD = 83.67). Fork length for prespawners ($n = 167$) ranged from 252 mm to 631 mm and averaged 480.4 mm (SD = 76.6).

The 174 fish captured between 19 June and 15 August were used for apportioning the 11,643 Dolly Varden counted during the sample period (Table 1; Figure 5). Overall the sample was comprised of 97.1% prespawning fish, which resulted in an estimated 11,481 (SE = 72.4) prespawning Dolly Varden passing upstream of the weir.

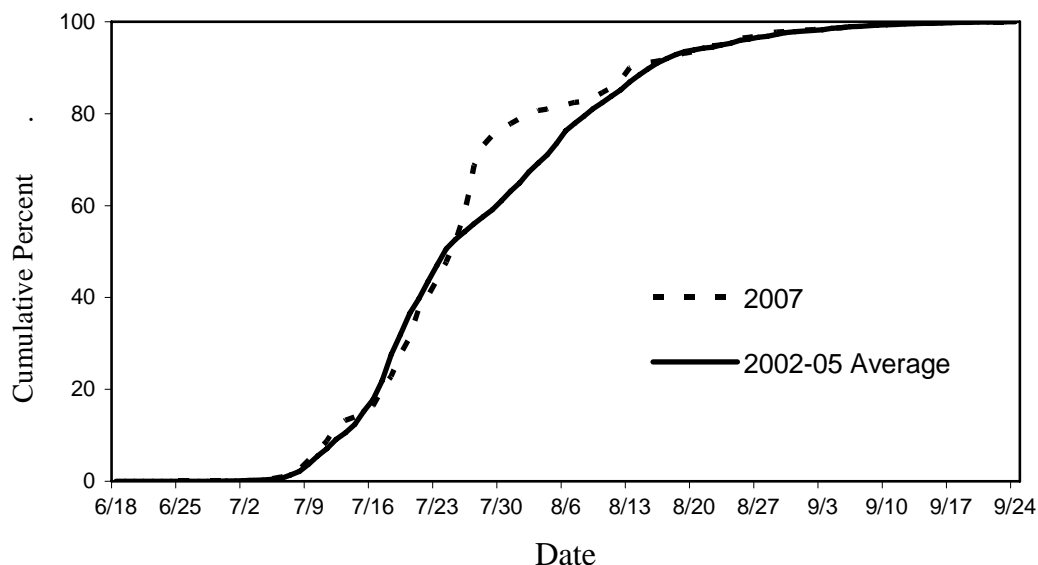


FIGURE 2. —Recent and historical average cumulative counts expressed as a proportion of the total run of Dolly Varden, Kanektok River.

Table 1. —Estimated prespawning (PR) Dolly Varden at the Kanektok River weir, 2007.

Time strata	Weir count	Number sampled	Percent sampled	Number prespawners	Percent PR in sample	Estimated PR	SE
1	5,167	150	2.9%	145	96.7%	4,995	72.4
2	6,486	24	0.4%	24	100.0%	6,486	0.0
Total	11,653	174	1.5%	169	97.1%	11,481	72.4

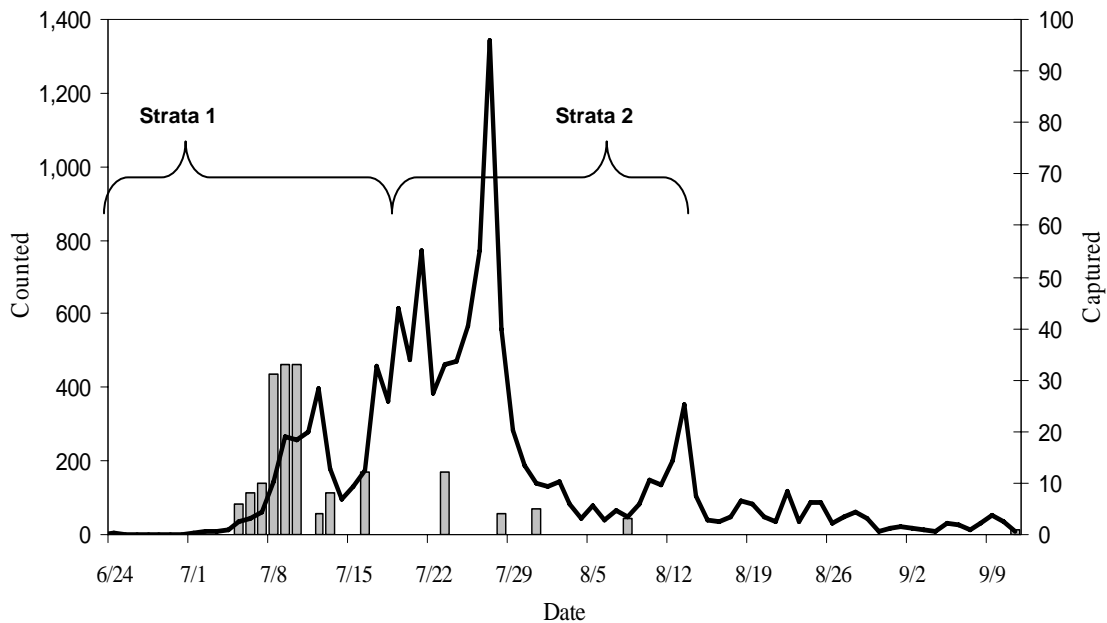


FIGURE 3. —Number of Dolly Varden counted (line) and captured (bars) at the Kanektok River weir, 2007.

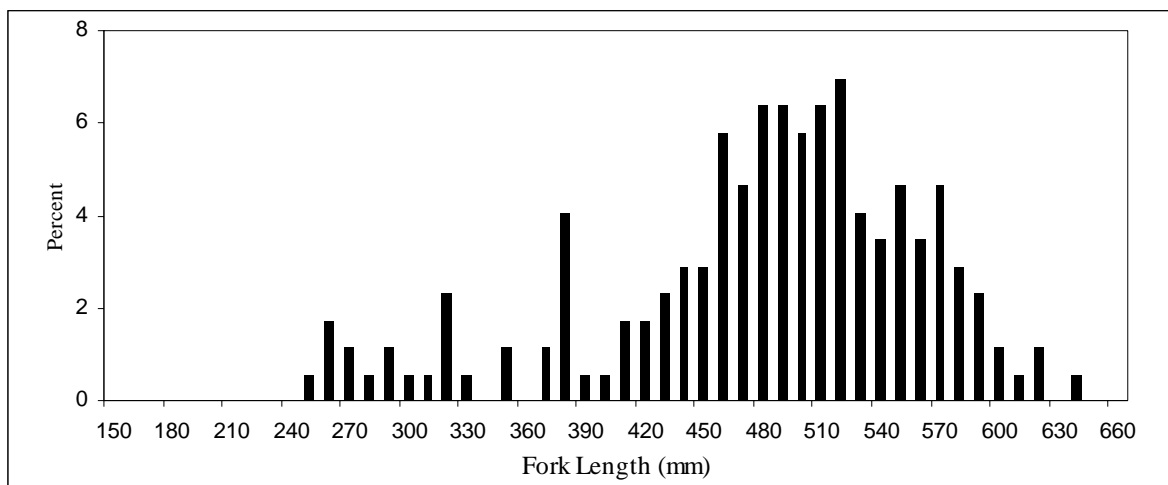


FIGURE 4. —Length frequency distribution for Dolly Varden caught (N = 173), Kanektok River, 2007.

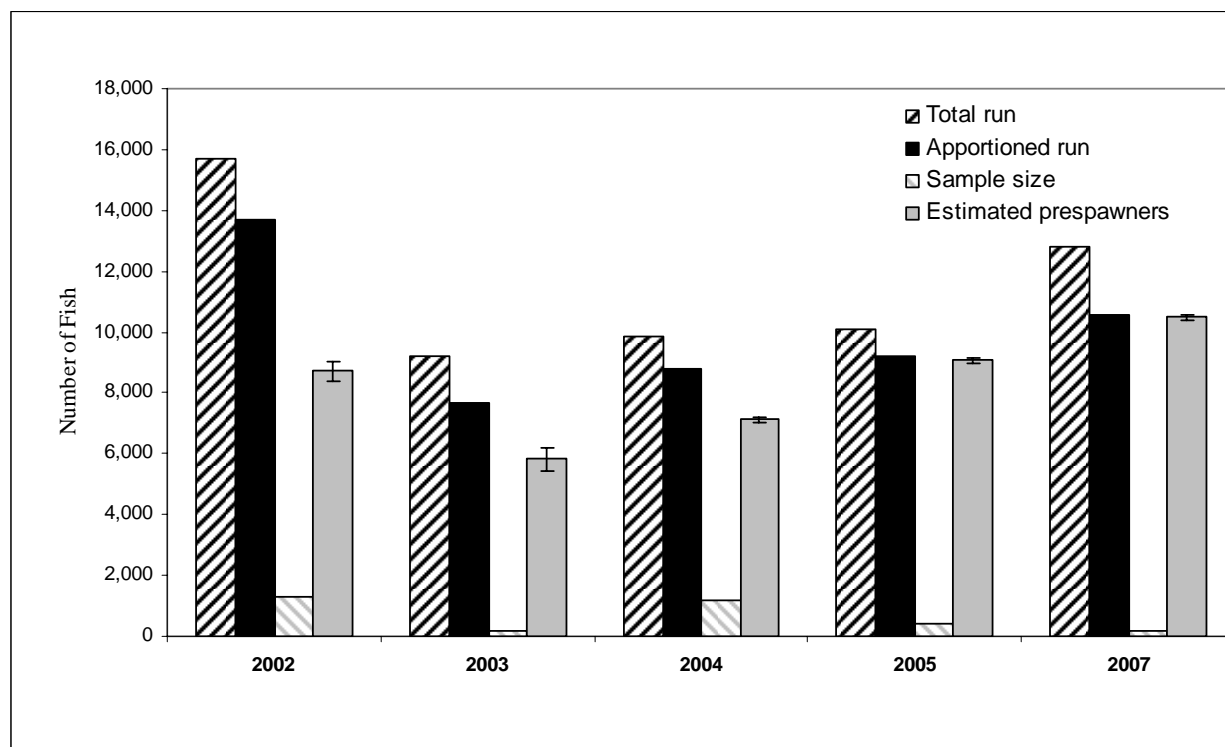


FIGURE 5. —Number of Dolly Varden counted for the season (total run), counted during study period (apportioned run), sample size, and estimated prespawner abundance with 95% confidence intervals, Kanektok River, 2002 - 2007.

Discussion

The objective to document run timing of Dolly Varden in the Kanektok River was successfully achieved in 2007. The 2007 run timing was similar in duration to previous runs, but the majority of the run was more compressed as 70% of the run was observed to have passed through the weir approximately nine days earlier than the historical average (Appendix 1; Appendix 2). The total Dolly Varden run ($N = 12,784$) was the second highest run recorded during the five years of this project. The estimated 11,481 mature, prespawning Dolly Varden that passed upstream of the weir in 2007 was the highest estimated to date (Appendix 5, 6). The accuracy of this estimate is difficult to assess, but it is likely biased high due to the small sample size (1.5% of the run), the high proportion of mature fish in the sample, and the high proportion of large fish (> 420 mm) in the sample. The overall proportion of prespawners in the 2007 sample (97.1%) was among the highest recorded over the five years of this project. Samples were only collected during 14 days of the 58 day sampling period (19 June to 15 August). The majority (76%) of these samples were collected prior to 16 July, whereas only 18% of the apportioned run had passed upstream at that time. Sampling only the earliest portion of the run would tend to bias the sample towards the larger mature fish. The proportion of mature fish is expected to be higher in the early part of the run and typically declines over time (Whalen 1992, Larson 1997, Lisac and Nelle 2000, Lisac 2002, 2004, 2006, 2007a). Similarly the size of the fish also declines over time (Lisac 2004, 2006). By not sampling the latter half of the run it is possible that the smaller, immature fish

component was not accounted for. These smaller fish would have however, been included in the daily visual counts.

To improve the confidence in the estimate of Dolly Varden prespawner abundance in the Kanektok River future monitoring of the run should focus on additional crew training and improving the sample quality. It is important to distribute the sample effort throughout the run and achieve a sample size equivalent to at least 10% of the total fish counted through the weir during each time strata.

Acknowledgements

Funding and support for this project were provided by the U.S. Fish and Wildlife Service Office of Subsistence Management, the Alaska Department of Fish and Game Commercial Fisheries Management Division, and the Coastal Villages Region Fund. Additional support was provided by the Native Village of Kwinhagak. Field data collection was accomplished by ADFG technician Patrick Jones, Elizabeth Smith, Brian Latham, and the Native Village of Kwinhagak technicians Carl Jones, Thaddeus Foster, Markus Henry, and Kris Sharp. M. James LaWonn compiled the field data and conducted preliminary analysis. This report was improved by the review and edits provided by Patrick Walsh, Tim Sundlov and Troy Jaecks.

References

- Chythlook, J. 2006. Fishery Management Report for Sport Fisheries in the Kuskokwim Management Area for 2003 - 2005. Alaska Department of Fish and Game, Fishery Management Report Series No. 06-65, Anchorage.
- Crane, P., M. J. Lisac, B. Spearman, E. Kretschmer, C. Lewis, S. Miller and J. Wenburg. 2003. Microsatellite marker development and use in population and mixed-stock analysis for Dolly Varden in the Togiak River Drainage. Final Report for Fishery Information Services Division Project FIS 00-011. Conservation Genetics Laboratory. Anchorage, Alaska.
- Cochran, W. G. 1977. Sampling techniques, third edition. John Wiley & Sons, New York.
- DeCicco, A. L. 1985. Inventory and cataloging of sport fish and sport fish waters of western Alaska with emphasis on Arctic char life history studies. Alaska Department of Fish and Game Sport Fish Division. Annual Performance Report, Vol. 26, Study G-I.
- Estensen, J. L. 2001. Middle Fork Goodnews River fisheries studies, 2000 - 2001. Alaska Department of Fish and Game, Commercial Fisheries Division. Regional Information Report No. 3A02-31.
- Larson, L. L. 1997. Lower Kenai Peninsula Dolly Varden studies during 1995. Alaska Department of Fish and Game, Fishery Data Series Number 97-2, Anchorage, Alaska.
- Lisac, M. J. 2004. Run timing, seasonal distribution and biological characteristics of Dolly Varden *Salvelinus malma* in the Middle Fork Goodnews River, Togiak National Wildlife Refuge, 2001. Final Report. U.S. Fish and Wildlife Service, Dillingham, Alaska.

- Lisac, M. J. 2006. Run timing, seasonal distribution and biological characteristics of Dolly Varden in the Kanektok River, Togiak National Wildlife Refuge, 2002 - 2003. U.S. Fish and Wildlife Service Alaska Fisheries Technical Report Number 94. Dillingham, Alaska.
- Lisac, M. J. 2007a. Abundance and run timing of Dolly Varden in the Middle Fork Goodnews River, 2003 – 2006. U.S. Fish and Wildlife Service Alaska Fisheries Data Series Report Number 2007-8. Anchorage, Alaska.
- Lisac, M. J. 2007b. Abundance and run timing of Dolly Varden in the Kanektok River, 2002 – 2005. U.S. Fish and Wildlife Service Alaska Fisheries Data Series Report Number 2007-6. Anchorage, Alaska.
- Lisac, M. J. 2008. Abundance and run timing of Dolly Varden in the Middle Fork Goodnews River, 2007. U.S. Fish and Wildlife Service Alaska Fisheries Data Series Report Number 2008-7. Anchorage, Alaska.
- Lisac, M. J. and J. F. Bromaghin. 2007. Abundance estimate of spawning Dolly Varden in tributaries of the Togiak River, Togiak National Wildlife Refuge, Alaska, 2003. U.S. Fish and Wildlife Service Alaska Fisheries Technical Report Number 98. Anchorage, Alaska.
- Lisac, M. J. and W. Buchholtz. 2001. Spawning grounds surveys and genetic tissue collections of Dolly Varden in the Togiak River drainage, Togiak National Wildlife Refuge. Dillingham, Alaska.
- Lisac, M. J. and J. R. Moran. 1999. Migratory behavior and seasonal distribution of Dolly Varden *Salvelinus malma* in the Togiak River watershed, 1998, Togiak National Wildlife Refuge. Progress Report. U.S. Fish and Wildlife Service. Dillingham, Alaska.
- Lisac, M. J. and R. D. Nelle. 2000. Migratory behavior and seasonal distribution of Dolly Varden *Salvelinus malma* in the Togiak River watershed, Togiak National Wildlife Refuge. Final Report. U.S. Fish and Wildlife Service. Dillingham, Alaska.
- Jones, P. W. and J.C. Linderman Jr. 2006. Kanektok River salmon monitoring and assessment, 2005. Alaska Department of Fish and Game, Fisheries Data Series Report 06-48, Anchorage.
- Reynolds, J. B. 2000. Life history analysis of Togiak River char through otolith microchemistry. Final Report. Unit Cooperative Agreement 1434-HQ-97-RU-01582. Research Work Order 91. University of Alaska, Alaska Cooperative Fish and Wildlife Research Unit, Fairbanks, Alaska.
- Walsh, P., P. Crane, and J. Wenburg. 2005. Genetic relationships of lake trout *Salvelinus namaycush* on Togiak National Wildlife Refuge, Alaska. 2005 Progress Report. U.S. Fish and Wildlife Service, Dillingham, Alaska.
- Whalen, M. E. 1992. Stock assessment of Dolly Varden in the Buskin River, Kodiak, 1991. Alaska Department of Fish and Game, Fishery Data Series Number 92-29, Anchorage, Alaska.
- Wolfe, R. J., J. J. Gross, G. J. Langdon, J. M. Wright, G. K. Sherrod, L. J. Ellanna, V. Sumida, and P. J. Usher. 1984. Subsistence-based economies in coastal Communities of Southwest Alaska, Technical Paper No. 89. Alaska Department of Fish and Game, Subsistence Division. Anchorage, Alaska.

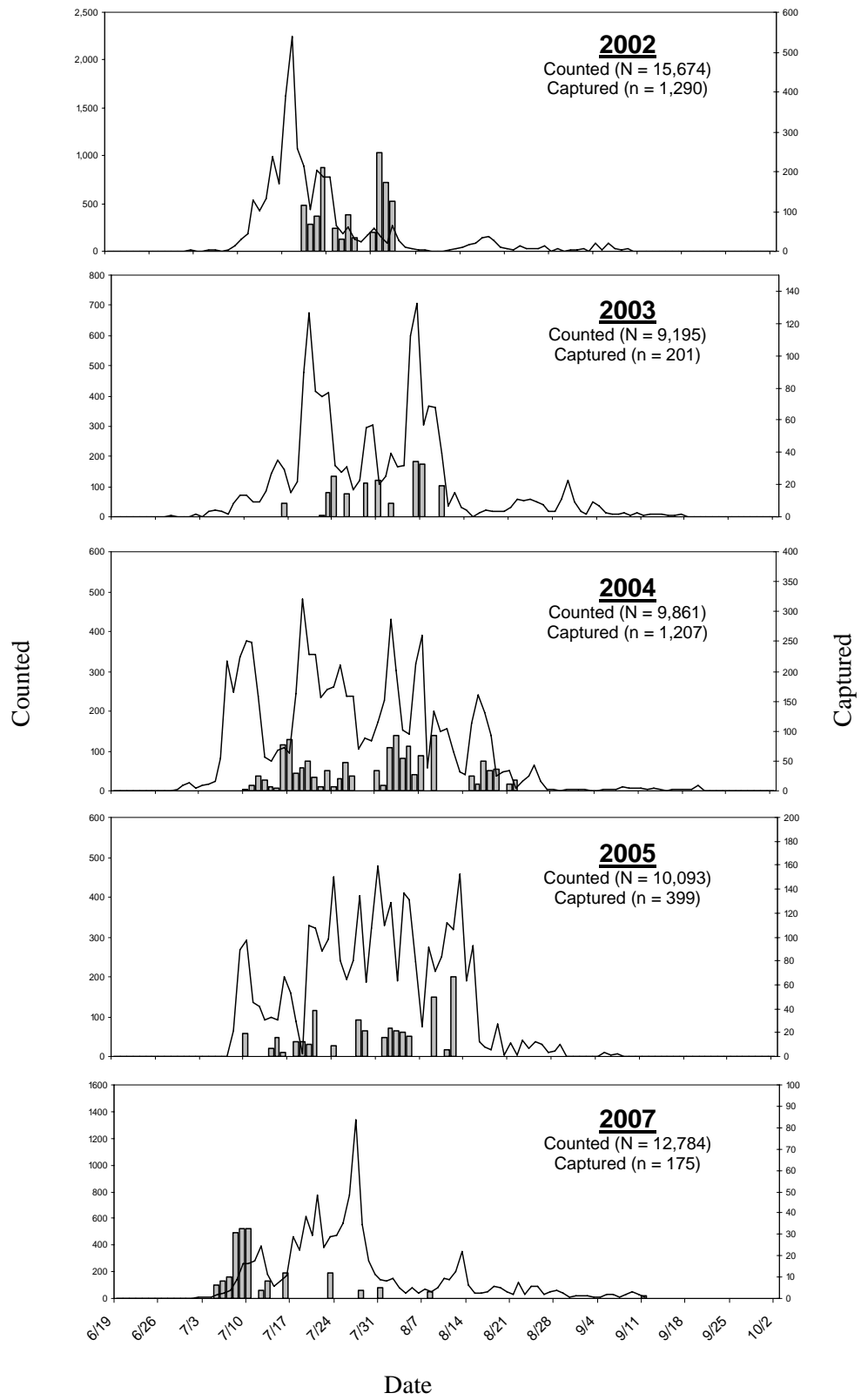
APPENDIX 1. —Historical Dolly Varden daily count and total run with the midpoint (box), and peak (50%) of the run (shaded area) highlighted, Kanektok River 2002 - 2007.

Date	2002	2003	2004	2005	2007
6/18					
6/19					1
6/20					1
6/21					0
6/22					0
6/23					0
6/24		0			3
6/25		0			0
6/26		1			1
6/27		1			0
6/28		5			1
6/29		0	2		0
6/30		1	12		2
7/01	7	1	20		4
7/02	18	9	8		10
7/03	6	2	15		7
7/04	5	17	17		12
7/05	12	23	25		34
7/06	10	18	81		44
7/07	6	7	325		59
7/08	21	44	248	65	143
7/09	53	72	337	267	266
7/10	128	72	375	292	257
7/11	177	49	374	137	277
7/12	543	48	237	126	395
7/13	418	87	86	93	179
7/14	551	145	74	100	94
7/15	993	186	101	91	132
7/16	700	157	109	201	176
7/17	1,623	81	94	158	460
7/18	2,245	116	243	88	363
7/19	1,071	479	480	7	615
7/20	893	673	341	329	475
7/21	431	414	342	322	771
7/22	848	400	235	266	385
7/23	771	409	254	295	461
7/24	770	170	261	450	473
7/25	271	148	314	239	566
7/26	178	167	237	194	774
7/27	253	88	237	242	1,343
7/28	128	121	104	402	557
7/29	94	295	132	187	282
7/30	175	304	125	322	186
7/31	242	108	173	477	141
8/01	154	136	228	330	133
8/02	90	210	431	386	146
8/03	263	164	303	189	84
8/04	109	170	153	410	43
8/05	48	601	141	394	78
8/06	24	706	320	236	41
8/07	10	305	390	75	66

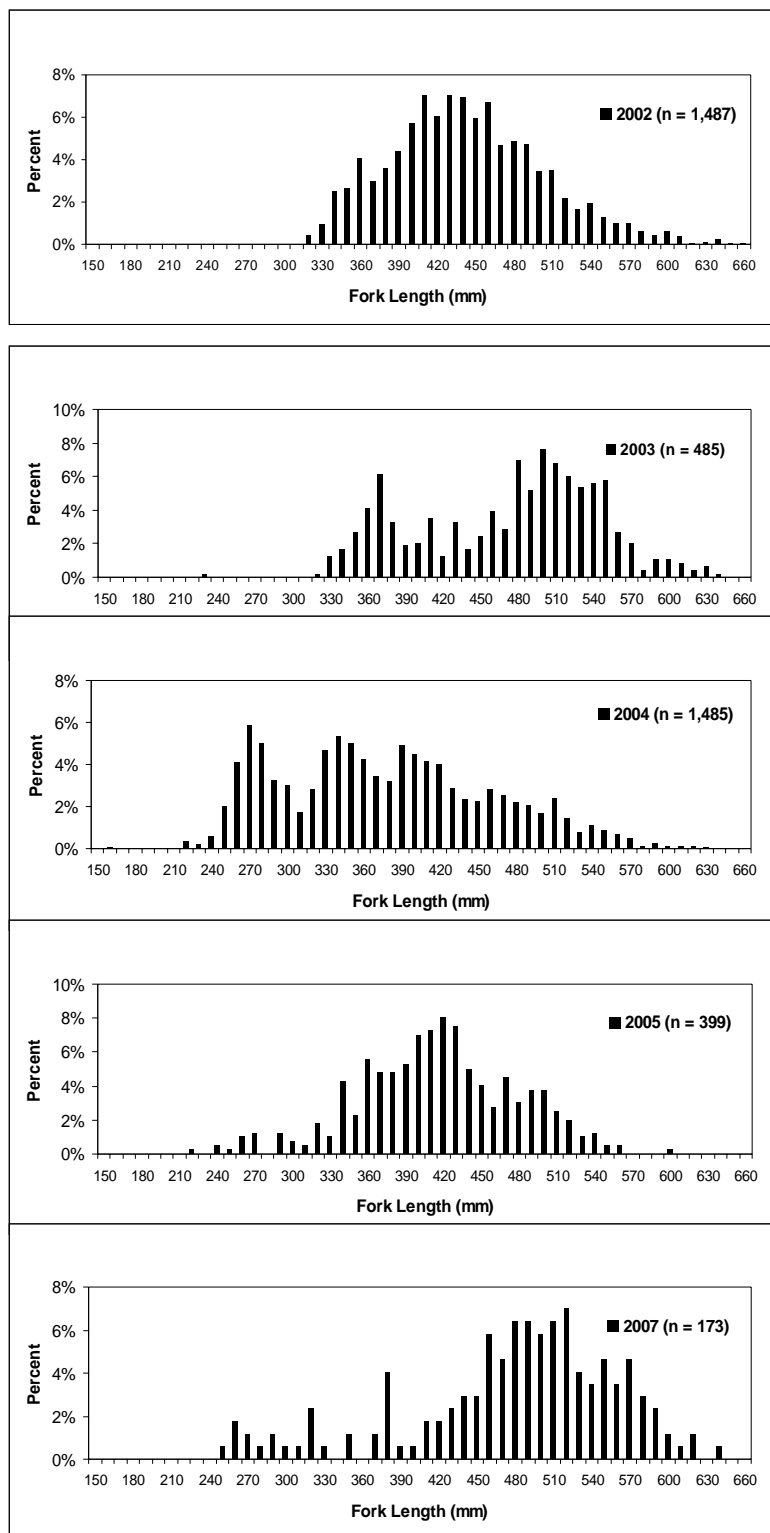
APPENDIX 1. —Historical Dolly Varden daily count and total run with the midpoint (box), and peak (50%) of the run (shaded area) highlighted, Kanektok River 2002 - 2007. (continued)

Date	2002	2003	2004	2005	2007
8/08	15	367	58	275	46
8/09	7	361	200	213	81
8/10	1	209	148	251	149
8/11	5	37	155	336	136
8/12	12	80	98	319	202
8/13	26	30	47	457	354
8/14	46	21	39	191	103
8/15	76	2	169	279	41
8/16	91	13	242	36	36
8/17	138	23	195	23	46
8/18	157	18	139	16	92
8/19	107	18	36	80	84
8/20	46	18	48	4	47
8/21	24	30	51	34	34
8/22	8	59	8	4	117
8/23	62	52	23	42	35
8/24	32	57	36	20	89
8/25	32	51	63	37	87
8/26	23	38	24	32	32
8/27	51	19	3	9	49
8/28	6	20	3	13	59
8/29	25	58	0	32	42
8/30	2	122	2		7
8/31	15	48	2		19
9/01	18	20	4		22
9/02	27	10	2		16
9/03	5	50	1		14
9/04	88	35	0	0	7
9/05	13	15	4	9	29
9/06	86	11	2	2	26
9/07	28	8	3	8	13
9/08	12	15	9	1	32
9/09	27	5	8		54
9/10	7	14	7		35
9/11	2	6	7		8
9/12	3	11	2		
9/13	3	10	6		
9/14	0	8	5		
9/15	4	4	1		
9/16	3	3	5		
9/17	1	9	3		
9/18	1		4		
9/19	0		3		
9/20	0		12		
9/21					
Total	15,674	9,195	9,861	10,093	12,784

APPENDIX 2. —Number of Dolly Varden counted (line) and captured (bar) at the Kanektok River weir, 2002 to 2007.



APPENDIX 3. —Length frequency distribution expressed as percent of sample and the number of Dolly Varden sampled per year at the Kanektok River weir, 2002 to 2007.



APPENDIX 4. —Mean fork length and size range for Dolly Varden caught at the Kanektok River weir, 2002 - 2007.

	2002	2003	2004	2005	2007
<u>All</u>					
Mean FL	438.7	466.5	372.8	410.6	474.2
SD	60.69	71.76	83.80	63.91	6.38
Minimum	313	230	154	215	241
Maximum	658	621	624	600	631
N	1,487	485	1,458	399	173
<u>Prespawners</u>					
Mean FL	470.1	480.4	409.2	410.6	480.4
S.D.	51.08	62.95	74.24	63.91	5.93
Minimum	320	335	216	215	252
Maximum	640	621	624	600	631
N	866	428	939	393	167

APPENDIX 5. —Dates of operation, total run, sample size and estimated prespawning Dolly Varden at the Kanektok River weir, 2002 to 2007.

Year	2002	2003	2004	2005	2007
Dates of weir operation	7/01 – 9/20	6/24 – 9/18	6/29 – 9/20	7/08 – 9/08	6/19 – 9/11
Total run	15,674	9,195	9,861	10,093	12,784
Sample period dates	7/10 - 8/03	7/16 - 8/10	7/10 - 8/22	7/8 - 8/12	7/5 – 9/11
Number of fish captured	1,487	485	1,458	399	175
Number of fish used for apportioning weir counts ¹	1,290	201	1,207	399	174
Percent prespawners	55.0%	73.6%	72.8%	98.5%	97.1%
Apportioned dates	7/01 – 8/03	6/26 – 8/10	6/29 – 8/22	7/08 – 8/12	6/19 – 8/15
Apportioned weir count	13,684	7,657	8,769	9,221	11,653
Estimated prespawners	8,709	5,815	7,130	9,073	11,481
SE	170.7	198.2	47.6	53.1	72.4

¹ Only days with complete capture information and reliable maturity index assignments were used.

APPENDIX 6. —Estimated prespawning (PR) Dolly Varden at the Kanektok River weir by time strata, 2002 to 2005 (Lisac 2007b) and 2007.

Year	Time strata	Weir count	Number sampled	Percent sampled	Number prespawners	Percent PR in sample	Estimated PR	SE
2002	1	12,299	480	3.9%	310	64.6%	7,945	170.2
	2	724	216	29.8%	143	66.2%	479	13.0
	3	661	594	89.9%	256	43.1%	285	1.8
	Total	13,684	1,290	9.4%	709	55.0%	8,709	170.7
2003	1	3,679	49	1.3%	39	79.6%	2,928	169.2
	2	1,429	66	4.6%	43	65.2%	931	53.7
	3	2,549	86	3.4%	66	76.7%	1,956	88.1
	Total	7,657	201	2.6%	148	73.6%	5,815	198.2
2004	1	2,540	228	9.0%	221	96.9%	2,462	26.9
	2	2,944	280	9.5%	273	97.5%	2,870	25.5
	3	2,397	516	21.5%	342	66.3%	1,589	29.3
	4	888	183	20.6%	43	23.5%	209	5.8
	Total	8,769	1,207	13.8%	879	72.8%	7,130	47.6
2005	1	1,954	79	4.0%	73	92.4%	1,806	53.1
	2	3,396	99	2.9%	99	100.0%	3,396	0
	3	3,871	221	5.7%	221	100.0%	3,871	0
	Total	9,221	399	4.3%	393	98.5%	9,073	53.1
2007	1	5,167	150	2.9%	145	96.7%	4,995	72.4
	2	6,486	24	0.4%	24	100.0%	6,486	0.0
	Total	11,653	174	1.5%	169	97.1%	11,481	72.4